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the character of the reaction, or by altering both. Cases of this kind are cited from his own researches and those of KLEBS, ROTHERT, VÖCHTING, and others. This variation in sensitiveness has a parallel in that of other physiological characters, as, for example, the behavior of aerobes toward oxygen, luminescence, pigment-formation, etc. The specific effect of acids and alkalis is likened to the effects of H^+ and OH^- ions on various functions. Other observers, notably SHIBATA, have shown similar chemotactic sensitiveness of spermatozoids to both anions and cations.

The author points out "interesting and far-reaching analogies" between the *chemischer Sinn* of bacteria and the corresponding *Geschmackssinn* of man, and suggests that further investigations may find these phenomena more complicated than they now appear.—C. R. B.

Camptotropism and geotropism.—Two new terms are added to the vocabulary of irritable phenomena, and some interesting reactions described by BÜCHER.²⁵ It appears that when a shoot capable of growth is forcibly bent, it reacts to the tensions thereby set up by thickening the walls and reducing the cell diameter in the mechanical tissues (collenchyma, bast, wood) on the convex side, and conversely, forming thinner walls and larger cells on the concave side. This reaction is due to *Kamptotropismus*, being interpreted as belonging to the same category as WIESNER's heterotropisms. In like manner when a similar shoot, geotropically sensitive, is fastened in the horizontal position and prevented from responding to gravity, anatomical changes of the same kind ensue, which BÜCHER ascribes to geotropism. It is unfortunate that the new term is so like the well-established geotropism, with which it will be difficult to prevent confusion, even in English speech.

Simple strain, in the normal position, as BALL showed, does not effect such anatomical changes; but both pressure and traction are effective in the phenomena referred to. The presentation time varies from 24 to 48 hours and the reaction time in *Ricinus* and *Phaseolus* is about 3 days. Forcible curvature and restrained geotropic response combined give a summation effect; opposed, one usually prevails strikingly over the other. In *Ricinus* the geotropic, in *Abutilon* and *Euphorbia* the camptotropic response dominates. A similar reaction was found in heliotropic stems; analogously, heliotrophism may be predicated. In the excentric growth of the lateral branches of trees there are special reactions which affect the activity of the cambium and its differentiation, but geotropism is restricted to young parts. Various observers have shown that there are also other causes for heterotropism.—C. R. B.

Life-history of cotton.—BALLS²⁶ has studied the life-history of *Gossypium* from floral development to the early stages of the embryo. Aborted anthers are

²⁵ BÜCHER, H., Anatomische Veränderungen bei gewaltsamer Krümmung und geotropischer Induktion. *Jahrb. Wiss. Bot.* 43:271-360. *figs.* 40. 1906.

²⁶ BALLS, W. L., The sexuality of cotton. Reprint from Yearbook of the Khedivial Agric. Soc. Cairo. 1905. pp. 26. *pls.* 9.